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Executing effective mission command has always been a challenge and in today's technologically saturated joint operating environment is doubly so, but not solely for the reasons expected. History has seen the progression of technology enable commanders and staffs to extend their reach and provide more centralized control over subordinate commands in near real time affording the management of synchronizing the battle space for the commander, and allowing decentralized operations and freedom of action by subordinates, but this can come at the cost of executing effective mission command. The development, adoption, and incorporation of new technologies for Joint Command, Control, Communications, Computers, and Intelligence (JC4I) has not been done in a holistic manner, which negates the effectiveness of communications and precludes seamless integration of those components creating operational frustrations. In order to be more effective at executing tasks and efficient at employing finite resources in an ever-increasing joint command structure, commanders must leverage the appropriate capabilities.

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JOINT FORCES STAFF COLLEGE

JOINT ADVANCED WARFIGHTING SCHOOL

Mission Command and JC4I: Managing Chaos in a Dynamic World

By

Ian S. Bennett

Colonel, United States Army

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Mission Command and JC4I: Managing Chaos in a Dynamic World

By

Ian S. Bennett

Colonel, United States Army

A paper submitted to the Faculty of the Joint Advanced Warfighting School in partial satisfaction of the requirements of a Master of Science Degree in Joint Campaign Planning and Strategy. The contents of this paper reflect my own personal views and are not necessarily endorsed by the Joint Forces Staff College or the Department of Defense.

This paper is entirely my own work except as documented in footnotes.

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20 April 2018

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Abstract

Executing effective mission command has always been a challenge and in today's technologically saturated joint operating environment is doubly so, but perhaps not solely for the reasons expected. History has seen the progression of technology enable commanders and staffs to extend their reach and provide more centralized control over subordinate commands in near real time, affording the management of synchronizing the battle space for the commander, and allowing decentralized operations and freedom of action by subordinates, but this can come at the cost of executing effective mission command.

The development, adoption, and incorporation of new technologies for Joint Command, Control, Communications, Computers, and Intelligence (JC4I) has not been done in a holistic manner, which negates the effectiveness of communications and precludes seamless integration of those components creating operational frustrations. In order to be more effective at executing tasks and efficient at employing finite resources in an ever-increasing joint command structure, commanders must leverage the appropriate capabilities to achieve the requisite effects on the land, air, sea, space, and cyber domains. The Department of Defense (DoD) can only accomplish this by applying the art of mission command and integrating joint communications to build interoperability and facilitate mission accomplishment.

Dedication

I would like to dedicate this work to the future since it is timeless whereas this work is not. I sincerely hope that there is a convergence of mission command and JC4I in the near future.

Acknowledgments

I would like to acknowledge all those whose time I have taken in asking questions, had the patience to review my work, and have provided assistance. In particular, I would like to thank my wife and my parents for providing reviews and recommendations for my writing. Mr. Art MacDougall from the Joint Forces Staff College JC4I course provided initial feedback and guidance from the beginning and Mr. Tony Oliver from Joint Staff J6 provided additional insight into the joint communications realm. Finally, I would like to thank Dr. Bryon Greenwald, Col James Golden, and Col Jody Owens for their mentorship and critical feedback that proved to be instrumental in writing this thesis. I would be remiss if I failed to thank Mr. Jeff Turner for his patient tutelage in the finer arts of the mechanics of writing and who helped codify ramblings into more cogent thought.

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Table of Contents

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Chapter 1: Introduction

According to the U.S. Army, mission command "helps commanders capitalize on the human ability to take action to develop the situation and integrate military operations to achieve the commander's intent and desired end state. Mission command emphasizes centralized intent and dispersed execution through disciplined initiative."[1] While this definition is from Army doctrine, most military actions involve more than one service and are, by definition, joint. Thus it follows that technology should enhance the ability of the joint force to command and control.

However, combat is complex and command and control (C2) during combat operations is only as effective as the means available to communicate across the organization as a whole. Technology resident in joint command, control, communications, computers, and intelligence (JC4I) architecture enables commanders to expand their span of control and synchronize the efforts of their forces across the operational battlespace.

If all systems were interoperable and each service employed mission command similarly, it would then naturally enhance joint C2 (JC2). Unfortunately, this is not necessarily the case. Service parochialisms drive differences in how each Service views mission command. The technologies acquired to enable mission command for one Service often fail to integrate seamlessly with another Service within a joint environment.

Dr. Bryon Greenwald, Professor of History at the Joint Forces Staff College, noted in his article, "Joint Capability Development", that "in this environment, current stovepiped requirements and acquisition processes, based on Service Title 10

[1] U.S. Department of the Army, *ADRP 6-0: Mission Command,* Army Doctrine Reference Publication 6-0 Change 2 (Washington D.C.: Headquarters, Department of the Army, 17 May 2012), 1-1.

responsibilities alone, have failed to produce the interoperability and interdependency necessary to command and control today's joint forces."[2] Stovepiped processing and the current acquisition process leads to diminished and desynchronized C2 capability and thereby inhibits efficient mission command and the execution of effective operations.

Three factors contribute to diminished mission command. First, while the theory of mission command is generally sound, the historical evolution and application of technology to advance mission command demonstrates a misunderstanding of the needs for Joint JC4I and the disruption associated with technical innovation. Second, joint doctrine does not adequately define mission command holistically for a joint command and fails to highlight the importance of integrating JC4I platforms. Third and finally, the failure to adopt compressively integrated JC4I leads to inefficient systems that lessen the effectiveness of mission command at the joint level.

To provide a means for achieving unified command and control across all domains and enable a more effective joint force, the development of joint mission command doctrine must establish a baseline while taking into account different service perspectives. To enable coherent control of joint forces, an integrated, comprehensive JC4I architecture is essential. To be more effective at executing tasks and efficient at employing finite resources in an ever-increasing joint command structure, commanders must leverage the appropriate capabilities to achieve the requisite effects through land, air, sea, space, and cyber domains. Commanders should apply the art of mission command and integrate JC4I in order to flatten command architecture, build C2

[2] Bryon Greenwald, "Joint Capability Development," *Joint Forces Quarterly*, Issue 44, 1st Quarter (2007): 50.

interoperability, and create a comprehensive joint understanding and employment of mission command in order to facilitate mission accomplishment.

Understanding Mission Command

Properly understood, the concept of mission command together with integration of the applicable technologies enhances the ability of an organization to conduct command and control. Mission command and associated C2 technologies should enhance the ability to conduct C2 for an organization. This is certainly the case if all systems are interoperable and each organization has both the same understanding of mission command and an integrated communications and computer system. However, at the joint level, mission command is subject to both the foibles of service-centric thinking and the continued purchase of non-integrated technologies. To correct these problems, leaders first have to answer the following questions:

- What does mission command mean at the joint level and why is it important?
- What complicates mission command at the joint level?
- What are the critical components of mission command and C4I?
- How does a comprehensive JC4I structure limit dysfunction?
- Does integrated JC4I automatically equate to effective mission command?

Ultimately, non-integrated and service specific C4I architecture limits the execution of mission command. The non-integrated approach creates stovepiping of units instead of a system that allows a greater capacity to integrate different capabilities and provide the joint commander a truly joint capable force where sensors can easily communicate with shooters and commanders have unrestricted communications with subordinates.

Ensuring integrated communications is the only way to provide distinct organizations the ability to plug-and-play and support the joint commander to set aside

Service-specific culture that may preclude seamless integration. According to the Capstone Concept for Joint Operations, "the ability of Joint Forces to operate effectively according to this concept will decline in relation to the number of units that cannot network with one another."[3] Much work has gone into attempting to integrate JC4I systems; however, until there is a concerted effort to enforce guidance and policy to ensure integration, the Services are afforded the opportunity to pursue their own systems to the detriment of seamless JC2 capability.

A firm understanding of mission command is required at the joint level to help drive the requirements for an integrated JC4I system that is employable worldwide, instead of having to be purpose-built and programmed for each requirement, which constrains overall effectiveness. The overall intent is to veer away from service specific C4I systems, ensuring that future C4I systems integrate fully within a joint environment. Fully integrated JC4I will enhance not only the efficiency of elements working within a joint environment, but also the joint commander's ability to exercise mission command.

History

There are several historical examples that demonstrate the value of linking mission command with key C4I technologies. In the American Civil War, Generals Lee and Jackson developed an effective command relationship through inherent trust. They communicated simply, yet effectively with minimal aid from existing communications technology while aggressively pursuing operations to win on the battlefield.[4] Shortly

[3] U.S. Joint Chiefs of Staff, *Capstone Concept for Joint Operations: Joint Force 2020*, (Washington D.C.:Joint Chiefs of Staff, 10 September 2012), 14.
[4] Mike Hennelly, "Lee's Lieutenants: Leadership Lessons from the Civil War for the Battlefield and the Boardroom," *War on the Rocks*, https://warontherocks.com/2017/05/lees-lieutenants-leadership-lessons-from-the-civil-war-for-the-battlefield-and-the-boardroom/ (accessed 01 November, 2017).

thereafter, Prussian General Helmuth Karl Bernhard von Moltke was one of the first theorists to define the modern concept of mission command and employ the telegraph to expand the commander's span of control.[5] Seventy years later, World War II saw systemic integration of the radio and the increased ability for commanders to direct subordinates throughout the battlefield.

The advent of computer integration as a critical component of the C2 architecture in modern warfare permits an incredible, and at times over-saturation of, information flow and an ability for strategic leaders to have insight into the activities of tactical level entities. Today, technology allows for real-time feedback and provides the ability for senior leadership to interact with tactical leaders on the ground. As a result, executing mission command in the 21st century is much more complex than at any time in history because the delineation between the levels of operations are more opaque, the spans of control are increasingly global, and the flow of information is nearly instantaneous. As Anthony King, the Chair of War Studies at the University of Warwick, states, "the changing character of operations and the expansion of the span of control facilitated by new technologies deepens and intensifies mission command into a highly distinctive phenomenon."[6]

Unfortunately, the historical trends in integrating technology indicates that the Army, Navy, Air Force, and Marine Corps (USMC) do not pursue full joint integration, but focus on what is good enough for the requirements of the time. As Greenwald notes, "historically, the Services…have been responsible for designing, procuring, fielding, and

[5] Daniel J. Hughes, ed. *Moltke on the Art of War; Selected Writings*, trans. Daniel J. Hughes and Harry Bell (Novato, CA: Presidio Press, c1993, 1993), 113.
[6] Anthony C. King, "Mission Command 2.0: From an Individualist to a Collectivist Model," *The US Army War College Quarterly Parameters* 47, no. 1 (2017): 18.

sustaining their own combat gear. This stovepiped process is part of each Service's Title 10 responsibility, which works well for Service-specific items."[7] Such a limited focus has led to piecemeal solutions -- amazingly even within the same organization--, stymied the seamless integration of C4I systems, and reduced the effectiveness of the collective organization. The lack of a coherent inter-service C4I system reduces the ability of forces to integrate effectively within a joint environment, where disparate units are employed in an attempt to provide tactical solutions to strategic- and operational-level problems.

JC4I

As the echelons of operations integrate globally, joint and complex C4I systems underwrite the art of mission command. Increased technology has reduced the time and space between the strategic and tactical commanders. Prior to the advent and employment of the telegraph, there was an obvious emphasis on commanders providing general guidance and subordinates exercising flexibility of action, since the ability to provide direct oversight was limited. However, as the technical capability to supervise subordinate units has increased, the practice of mission command has decreased, at times to deleterious effect.

Understandably, complications arise when different services, government organizations, coalitions, and partners try to work together because different operating procedures, structures, and technologies hinder the ability to integrate into a cohesive joint realm. The lack of incorporation limits the joint commander's efforts to employ a comprehensive approach to solve a problem, hampers the effectiveness of mission

[7] Greenwald, "Joint Capability Development," 50.

command, and complicates joint communications as well as shared achievement of understanding with other governmental agencies, allies, partners, and non-governmental organizations.

The Services within the Department of Defense (DoD) need to acknowledge that distinct Service-level approaches to mission command create friction inhibiting efficient and effective joint mission command, particularly in the failure to generate unity of command, interoperability, agility, and lethality which are perpetuated by the myriad of employed C4I systems. These systems sustain division rather than integration that achieves cooperative functions in support of mission command. For example, operating with different software versions of the same computer system may prevent the effective transfer of time critical data that precludes sharing of information. In another example, the employment of workarounds to generate fire missions between the Air Force and Army components adds time to mission processing and introduces the possibility of errors in transcribing from one system to another.

C4I systems do not magically make mission command happen. Rather C4I systems provide commanders both better situational awareness and the means to provide effective direction. Problems arise when systems are not integrated. Commanders may rely too heavily on technology, possibly negating the precepts of mission command and falling into the trap of micromanaging subordinate elements and stifling freedom of action by over-centralizing control, which comes at the cost of initiative and freedom of action by a subordinate commander.

Additionally, in today's digital world, information flow is increased and C2 systems can "transport and deliver information in quantities that can easily overwhelm

the commander."[8] Having the right set of C4I tools available to commands and an effective means to parse the flow of information into something that is useful affords the commander the right information at the right time to make the right decision. Doing so provides the appropriate level of guidance for a given situation without over-saturating subordinate commands with information and facilitates decentralized operations linked to a desired end state.

The Way Ahead

The 21st century has proven an amorphous operating environment, requiring an adaptive and effective organization set to tackle complex problems. To meet those changes, joint organizations need to integrate rapidly to achieve a level of efficiency and, more importantly, effectiveness. *The Capstone Concept for Joint Operations: Joint Force 2020* highlights the importance of integration, stating that "Joint Force elements, globally postured, combine quickly with each other and mission partners to integrate capabilities fluidly across domains, echelons, geographic boundaries, and organizational affiliations."[9] The days of single Service operations are long gone. Mission command "is the most appropriate command philosophy for the increasingly uncertain future environment because it empowers individuals to exercise judgement in how they carry out their assigned tasks."[10]

Achieving an integrated capability requires a holistic and non-compartmentalized joint communications functionality in order to facilitate command and control. Mission command is not a new concept, but represents how organizations, especially those in the

[8] U.S. Joint Chiefs of Staff, *Mission Command White Paper,* 7.
[9] U.S. Joint Chiefs of Staff, *Capstone Concept for Joint Operations: Joint Force 2020*. (Washington D.C.: Joint Chiefs of Staff, 10 September 2012), iii.
[10] U.S. Joint Chiefs of Staff, *Capstone Concept for Joint Operations: Joint Force 2020*, 4.

military, should manage the relationship between commanders, staffs, and subordinate elements. Mission command is a leadership management function, whereas JC4I is the mechanism for how units and organizations communicate. Integrating both facilitates unity of command, unity of effort, decentralized operations, and agility within an increasingly dynamic environment.

Moving forward, Chapter 2 defines Mission Command and examines its applicability to the joint commander. In doing so, it highlights the degree to which each Service embraces and codifies the mission command concept. Chapter 3 covers the history of the technologies enabling mission command and demonstrates the tendency towards more centralized control due to the ability for commanders to increasingly micromanage instead of enabling decentralized operations. Chapter 4 focuses on the concept of, and frustrations concerning, JC4I and highlights some of the concerns that a lack of integration has on the joint force. Chapter 5 synthesizes the findings of mission command, technology, and JC4I as well as provides insight and recommendations for a way ahead and it identifies the consequences of continuing to acknowledge but not adjusting to the needs of an increasingly complex joint environment.

Chapter 2: Definition and Application of Mission Command for the Joint Commander

Mission command is not a new aspect of leadership but rather an enduring part of commanding and controlling military units. Mission command, in essence, codifies how leaders and staffs operate within volatile operational environments.[1] At the joint level, mission command encompasses not only military components but also invariably involves other government and international entities participating in, assigned to, attached to, or in support of operations.

At its core, mission command "balances the art of command and the science of control" by providing sufficient direction without inhibiting subordinates' freedom of action.[2] Mission command facilitates providing guidance by a commander while simultaneously affording subordinate commanders the flexibility of decentralized operations. The concept of mission command mitigates reliance on centralized control and allows freedom of action by subordinate commands, especially on the data-filled modern-day battlefield.

Unity of Command, Unity of Effort, Decentralized Operations, and Agility within a Dynamic Environment

The DoD defines mission command as "the conduct of military operations through decentralized execution based upon mission-type orders."[3] Joint publication 3-0, *Joint Operations*, links mission command with the commander's intent and highlights the relevance to affording subordinate commanders "the greatest possible freedom of

[1] U.S. Army, *ADRP 6-0: Mission Command, 2-11.*
[2] Ibid, v.
[3] U.S. Joint Chiefs of Staff, *DoD Dictionary of Military and Associated Terms.* (Washington D.C.: Joint Chiefs of Staff, 2017), 157.

action."[4] Mission command supports three critical capabilities: 1) unity of command and effort; 2) decentralization of operations; and 3) agility within a dynamic environment.

Unity of command and unity of effort link organizations towards achieving a common purpose. The DoD defines unity of command as "the operation of all forces under a single responsible commander who has the requisite authority to direct and employ those forces in pursuit of a common purpose."[5] Similarly, unity of effort is the "coordination and cooperation toward common objectives, even if the participants are not necessarily part of the same command or organization."[6]

Decentralization of operations, otherwise understood as decentralized execution, "empowers subordinate leaders to advance their commander's intent through the most effective means at their disposal."[7] For decentralized operations to be effective, "commanders delegate decisions to subordinates wherever possible, which minimizes detailed control and empowers subordinates' initiative to make decisions based on the commander's guidance rather than constant communications."[8] Unity of command, unity of effort, and decentralized operations afford organizations the ability to operate fluidly throughout diverse and dynamic environments by linking command to unity of effort, empowering leaders through decentralized operations, and creating the agility to negotiate dynamic environments.

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[4] U.S. Joint Chiefs of Staff, *JP 3-0: Joint Operations,* Joint Publication 3-0 (Washington D.C.: Joint Chiefs of Staff, January 17, 2017), II-7.
[5] U.S. Joint Chiefs of Staff, *DOD Dictionary of Military and Associated Terms*, 244.
[6] Ibid, 244.
[7] U.S. Joint Chiefs of Staff, *Capstone Concept for Joint Operations: Joint Force 2020*, 4-5.
[8] U.S. Joint Chiefs of Staff, *JP 3-0; Joint Operations*, xi.

Understanding, Intent, and Trust

General Martin Dempsey highlighted the importance of mission command from his perspective as the Chairman of the Joint Chiefs of Staff, noting that "mission command challenges commands to cultivate a bias for action in their subordinates, develop a mutual trust and understanding, and exercise moral nerve and restraint."[9] In other words, mission command is applicable to all elements involved in operations and carries significance throughout an organization and the interpersonal relationships between commanders, staffs, and subordinates. General Dempsey also identified three attributes of mission command critical for joint organizations: understanding, intent, and trust.[10]

General Stanley McChrystal's concept of shared consciousness, a form of understanding, detailed in his book, *Team of Teams*, emphasizes that all members of his command understood and accepted the overall strategy while they worked towards a common purpose exemplifies the idea of understanding.[11] Intent means understanding what and why something needs to be done in order to achieve a desired end state. Finally, trust is imperative to instill the belief in accomplishing a task and providing support when required.

From a joint command perspective, mission command is one of "the guiding principles to organize the joint force for operations."[12] Such a joint command perspective allows the Services to provide "distinct capabilities to joint operations that enable joint

[9] U.S. Joint Chiefs of Staff, *Mission Command White Paper*, 4.
[10] Ibid, 5.
[11] Stanley McChrystal, Tantum Collins, David Silverman and Chris Fussell, *Team of Teams: New Rules of Engagement for a Complex World,* (New York, N.Y.: Penguin, 2015), 171
[12] U.S. Joint Chiefs of Staff, *JP 3-0: Joint Operations*, IV-4.

effectiveness."[13] Accordingly, mission command, along with the joint force command's mission, operational approach, and principle of unity of command, is a critical component to manage complicated battlefield actions without hamstringing subordinate commanders and inhibiting their ability to operate effectively in diverse and varied environments. Additionally, achieving success requires building trust within the force that further influences the capacity to conduct operations with a high level of confidence in accomplishing necessary objectives that subordinate commands accept the commands given.

As noted, mission command is an imperative for executing decentralized operations while simultaneously allowing flexibility of action at the tactical and operational levels. In theory, mission command should not constrain subordinate commanders' freedom of action to meet the variances of their mission while negotiating their respective operational environments. Mission command is akin to the way commanders manage command and control of subordinate organizations and partners, without constraining initiative or adding to the burden by becoming overly intrusive and micromanaging activities of subordinates. Thus mission command, to be effective, balances the tension of unilateral action against the possibility of micromanagement.

Mission command is central to the precept of unity of command as it establishes a clear and concise role both for and between commands to achieve unity of effort. Unity of effort is as true in the joint arena as it is within any of the Services because it allows commanders and staffs to integrate and work cohesively for common purpose while reducing friction between organizations. The flexibility achieved through unity of effort

[13] Ibid, IV-4

achieves organizational agility. Unity of command, unity of effort, and agility in a dynamic environment stem from intent, trust, understanding, and acceptance to build a more effective joint organization.

Mission Command in Action

The experiences of Joint Special Operations Command (JSOC) Task Force (TF) 714 during Operation Iraqi Freedom (OIF) well illustrate mission command in a dynamic theater. General Stanley McChrystal successfully integrated not only diverse special operations units into a cohesive cell, but also included a host of other governmental organizations that provided critical capabilities.[14] At the end of his tour in Iraq, by integrating what he called his "team of teams" into his adaptation of mission command, McChrystal was able to achieve a level of shared consciousness that was not only desirable for making an efficient command, but made it much more effective in combating an extremely violent insurgency.[15]

TF 714 learned that the effective application of mission command tenets mitigated friction within a joint command by the effective application of the tenets of mission command. Additionally, TF 714 employed a robust and integrated JC4I system, enabling the integration of distinct military and other governmental organizations that enhanced shared understanding throughout elements that did not habitually work together.[16] Mission command, enabled by JC4I, allowed the leadership to supervise and synchronize operations without micromanaging subordinate commands as they battled a pernicious and capable enemy.

[14] McChrystal et al, *Team of Teams: New Rules of Engagement for a Complex World*, 167-168
[15] Ibid , 20.
[16] Ibid, 168-169

Moreover, it encouraged subordinate commanders to make decisions and take initiatives previously reserved for higher levels of command. As trust and shared understanding grew, elements coordinated operations among each other at lower organizational levels and increased the speed and scope of operations.[17] The level of success achieved by TF 714 demonstrates an ideal of what right can look like. Mission command at a joint level is possible by effectively applying mission command by which the commands achieve common purpose by mitigating friction, sharing understanding, and synchronizing actions to afford desynchronized operations.

The Trouble with Joint Doctrine

In a perfect world, the Services would provide an interdependence that enhances the overall effectiveness of the joint force.[18] Each service provides unique capabilities the commander is able to leverage in order to gain a marked advantage against an adversary. When combined within a joint environment, the integration of distinct service capabilities should provide complimentary capabilities synchronized in time and space to enable unity of effort.

Joint doctrine uses the concepts of intent, understanding, and trust but does not discuss the details of each concept sufficiently to develop a full framework of application and integration of mission command functions for a joint command. Current joint doctrine provides a cursory mission command definition in the executive summary of *JP 3-0: Operations*, and goes into slightly more detailed conceptual discussions in the "C2 Considerations in Land Operations" section in *JP 3-31: Command and Control for Joint Land Operations*, without providing significant substance and explanation as to the

[17] Ibid, 251.
[18] U.S. Joint Chiefs of Staff, *JP 3-0: Joint Operations,* IV-4.

mechanics of mission command.[19] Because mission command depends on intent, understanding, and trust, joint doctrine should provide guidance on how to avoid undermining both the human dimension and function of mission command. Doctrine should also provide a tangible and working definition and framework easily understood by the joint force to provide a common starting point for joint commands and service components.

All Services implicitly or explicitly employ mission command in some form or fashion. The Navy and the Air Force conduct mission command through their activities, highlighting the requirements for centralized planning and decentralized execution, but do not capture the key tenets very well in their respective doctrines.[20] The Air Force's concept of command and control is based on the idea of "centralized control and decentralized execution," supporting mission command from an air perspective where "modern joint air operations and their unique aspects of speed, range, and flexibility demand a balanced approach to C2."[21] While the Air Force identifies the components of mission command, especially those concerning C2, the concept of mission command remains air-centric and has little applicability for a multi-domain joint force that consists of both air and ground forces.

[19] U.S. Joint Chiefs of Staff, JP 3-0: Joint Operations, executive, xi; U.S. Joint Chiefs of Staff, JP 3-31: Command and Control for Joint Land Operations, Joint Publication 3-31 (Washington D.C.:Joint Chiefs of Staff, February 24, 2014), IV-8 – IV-9

[20] Lt Col James W. Harvard, "Airmen and Mission Command," *Air & Space Power Journal* (March-April 2013), downloaded from www.airuniversity.af.mil www.airuniversity.af.mil/Portals/10/ASPJ/journals/Volume-27_Issue-2/F-Harvard.pdf).

[21] U.S. Department of the Air Force Annex 3-30 Command and Control (November 07, 2014), www.doctrine.af.mil/Portals/61/documents/Annex_3-30/3-30-D02-C2-Key-Considerations.pdf?ver=2017-09-19-1 (accessed February 20, 2018), 2; U.S. Department of the Air Force *Annex 3-30 Command and Control*, 2.

The Navy's definition of mission command, specifically C2, is similarly service focused, and "reflects [the Navy's] operational environment, traditions, and culture…is derived from the characteristics and complexity of the maritime domain."[22] Naval C2 is sufficient for naval forces that execute maritime functions and promotes command driven functions. As with the Air Force, the Navy lauds centralized planning and decentralized execution, but the focus is on maritime forces.[23]

The Army and the USMC codify mission command the best as the cornerstone of their concept of command and control. While both doctrines agree with the overarching concept of centralized planning and decentralized execution, they also highlight the importance of leadership and the human dimension to achieve an advantage over an adversary. The USMC, in the third edition of the *Marine Corps Operating Concepts* highlights the human dimension when stating, "the leadership habits of Mission Command cannot be 'trained' into a force, but must be more subtly 'imbued' by the words and example of confident leaders cultivated over time."[24] The Army is more comprehensive regarding defining mission command and more clearly identifies its components and key concepts. The Army's doctrine is a starting point for establishing a comprehensive joint concept of mission command by providing the requirements for C2 balanced with the employment of mission command.

Potential Framework for a Solution

Army Doctrine Reference Publication (ADRP) 6-0: Mission Command defines mission command as:

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[22] U.S. Department of the Navy, *Naval Warfare*, Naval Doctrine Publication 1, (March 2010), 35-36.
[23] U.S. Navy, *Naval Warfare*, Naval Doctrine Publication 1, 35.
[24] U.S. Marine Corps, *Marine Corps Operating Concepts 1-1 Mission Command,* Marine Corps Operating Concepts – Third Edition, (Washington D.C., June 2010), 26.

> The exercise of authority and direction by the commander using mission orders to enable disciplined initiative within the commander's intent to empower agile and adaptive leaders in the conduct of unified land operations. This philosophy of command helps commanders capitalize on the human ability to take action to develop the situation and integrate military operations to achieve the commander's intent and desired end state.[25]

ADRP 6-0 underscores the fact that command is a human endeavor requiring the constant interaction within an organization to achieve specific goals. Mission command is the mechanism by which commanders, with the aid of their staffs, are able to accomplish those goals through constant interaction and feedback with both subordinate and superior elements.[26]

The Army divides the concept of mission command into philosophy and function. In terms of philosophy, mission command is the "exercise of authority and direction by the commander using mission orders to enable disciplined initiative within the commander's intent to empower agile and adaptive leaders."[27] The principles outlined in ADRP 6-0 supporting the philosophy of mission command mirror and expand upon Dempsey's three attributes for mission command by emphasizing teamwork through mutual trust, shared understanding, commander's intent, initiative, employing mission orders, and affording commanders the responsibility of accepting prudent risk to the mission and to the force to achieve a desired end state.[28]

The function of mission command is achieving the balance between the art of command and the science of control by delineating the responsibilities of

[25] U.S. Department of the Army, *ADRP 6-0: Mission Command*, 1-1.
[26] Ibid, 1-3.
[27] Ibid, 1-1.
[28] Ibid, 1-3.

commands to lead, support, and synchronize operations. The balance strives to achieve unity of command and unity of effort while affording subordinate commanders the ability to execute decentralized operations.[29] While the definition is Army-based and identified as one of its principle warfighting functions, the concept is easily transferable to any service or component at the operational and strategic levels and is a feasible framework for developing a concept of mission command for the joint command.

Linking JC4I to Mission Command

While mission command has existed since the dawn of operations, the history of the development and incorporation of technologies provides insight as to how the ability to control has evolved. Future mission command will thus be highly collaborative as seniors and subordinates join in a circle of feedback, initiative, adaptation, and mission effectiveness.[30]

Mission command is the art of command and control and a critical component of leadership. Mission command is the codification of managing operations within the dynamic world of joint operations. The employment of mission command is very much the art of command whereas an integrated JC4I architecture enables the ability to control.

Mission command drives the process of command and control, and JC4I is the mechanism facilitating a command's capacity to conduct operations. JC4I exists to facilitate communications and the flow of information between elements

[29] U.S. Joint Chiefs of Staff; *JP 1: Doctrine for the Armed Forces Of the United States,* Joint Publication 1 (Washington D.C.: Joint Chiefs of Staff, July 12, 2017), IV-2.
[30] U.S. Joint Chiefs of Staff, *Capstone Concept for Joint Operations: Joint Force 2020*, 4-5.

to achieve mission command. An integrated communications architecture provides the backbone by which mission command is successful. For a joint command, the ability to "plug and play" disparate elements into a joint organization is key to its overall success because without the ability to communicate effectively, achieving unity of command and unity of effort becomes much more difficult.

Fortunately, a new generation of digital collaboration technology enables the joint force to realize mission command in powerful ways. Mobile devices with reach-back to network-based services will allow distributed commanders and staffs to collaborate as though co-located. Developing networks that can simultaneously integrate secure and non-secure communications will widen the circle of participants who can support a given operation, allowing diverse stakeholders to contribute insights and expertise in real-time.

Chapter 3: History of Mission Command and JC4I

Knowledge of the history of the interaction between mission command and JC4I systems is important to understand their symbiotic relationship. It provides a basis from which the interrelation of both should evolve to become more efficient and effective. The evolution of communications technology should enhance the art of mission command rather than support ineffective commanders and subordinates. Available communications technology has the potential to, if leveraged incorrectly, impede linking the art of mission command with the science of control. Today's battlefield sees myriad systems and technologies available at all levels of operations to transmit or transfer vast quantities of information. Unfortunately, this also makes oversaturation of information possible and invites a tendency to micromanage tactical situations.

It seems that as communications technology has advanced, the art of leadership and execution of mission command has declined. Technology affords senior commanders with numerous opportunities to micromanage and influence tactical operations through either poor command structures or a reliance on near real-time interaction among units. While nothing is more complex than commanding in combat, the requirement to shoot, move, and communicate effectively is an imperative exacerbated by the complexity of experiences on the multidimensional battlefield and thus challenges even the best commanders.

Historically, at the operational and strategic levels, the physical distance between echelons forced commanders to provide general guidance and afforded subordinate commanders the opportunity to conduct highly decentralized actions to meet the higher echelon's intent. Traditionally, successful commanders have issued clear, concise orders,

and then relied on subordinates to execute with vigor. Yet today the ability to communicate around the world at any time is incredibly easy and relatively inexpensive affording the ability to interact with someone almost instantaneously.

The Civil War relationships between the Confederate generals Robert E. Lee and Thomas "Stonewall" Jackson and their Union counterparts, Ulysses S. Grant and William T. Sherman, are excellent examples of command teams in which subordinates executed well-crafted instructions aggressively without relying on the aid of technology facilitating communications. The Prussian Army under General von Moltke and the US Pacific Fleet under Admiral Nimitz, facilitated by improved telegraph and the advent of radio respectively, are examples of superior commands where entire formations understood the commander's intent and fought over extended distances without constant and debilitating interference.

Communication between elements on the battlefield takes the form of a simple relay of information through some sort of visual or audible signal. In the distant past, messages were transmitted by signals such as smoke or fire, which could be seen over distances, or by messengers travelling by foot or horse. The advent of the telegraph was the first time that technology enabled strategic level leaders to communicate effectively and directly with subordinates at the operational and tactical levels. During the American Civil War, President Lincoln communicated directly with his battlefield commanders demonstrating the first documented use of the telegraph in war.[1] Since then, cyberspace communications have arrived at the fore and have provided ever-increasing levels of

[1] Tom Wheeler, "The First Wired President." *The New York Times* The Opinion Pages (24 May2012) https://opinionator.blogs.nytimes.com/2012/05/24/the-first-wired-president/, (accessed February 20, 2018).

interactions between formations. Despite these advances, the essence of effective communication remains human interaction.

Technology exists as a tool and facilitates communication, but does not replace the fact that there is a leader making the decisions and transmitting intent, task, and purpose to subordinates. Because communication is multi-directional, there remains a need to build trust and understanding between commanders and subordinates -- as well as among subordinates -- who execute what is required of them with the aim of achieving a desired common end-state. Today's technology offers a bit of insurance for a commander by providing the ability to oversee operations from afar. However, if inappropriately used, this technology can also erode the freedom of action that mission command is supposed to imbue on the subordinate.

Origins

There has always been the need to communicate between governments and their fielded forces. Thucydides captured this in the story of the conflict between Sparta and Athens.[2] There was a need to issue orders and provide guidance between the strategic commands and their subordinates conducting campaigns throughout the theater of operations. The physical environment and time limited these means of communication.

The physical operating environment consisted of land and water. Messengers, hand carrying or memorizing orders, were dispatched from their respective capitals to the generals in the field having to negotiate the terrain in order to deliver the communications. This was time consuming and required subordinate commands to

[2] Robert Strassler B., ed. *The Landmark Thucydides A Comprehensive Guide to the Peloponnesian War*, trans. Richard Crawley (New York; New York; U.S.A: Free Press, 1996).

operate relatively independently of higher commands within guidance they received sporadically.

The Spartans and Athenians were not alone in this conundrum. Every empire up to the 19th century had to communicate through similar means. Some, like the Romans, utilized horses. Others, like the Aztecs, relied exclusively on messengers who were fleet of foot. As empires and the span of control expanded, the available technology limited the means of communication. This meant that strategic level to tactical level commanders relied heavily on the art of mission command with minimal input from higher command.

The precepts of mission command existed, but there was a greater reliance on the fact that leaders had to understand intent and had a wide latitude through which to exercise freedom of action in order to meet a specified end state. Once launched, armies operated relatively independently of national commands so a strong trust that they would operate within intent remained paramount.

The Telegraph

The telegraph heralded the adoption of a revolutionary innovation in the realm of communications, and it had a significant impact on both command and control and the span of interaction between commands. A revolutionary innovation, according to Williamson Murray, affects more than just the implementation of a new technology. The innovation exists when the incorporation of new technologies radically "changes the basic operating framework that military organizations have about the relationships among weapons systems and those who use them against the enemy."[3]

[3] Williamson Murray, "Military Innovation in the Interwar Period", in Allan R. Millett and Williamson Murray, eds, (New York: Cambridge University Press, 2009), 306.

The telegraph radically shifted the means of communication, allowing commanders to be able to transmit orders across significant distances with relative ease. The nascent technology did have considerable physical shortcomings in terms of requiring wires and specialized training for key operators, and it suffered a susceptibility to interception and sabotage. However, as it evolved in the second half of the 19th century, the telegraph provided an early means to link commands more directly and nearly instantaneously and facilitated the transfer of information across great distances.

While the U.S. Civil War saw the early employment of the telegraph, Prussia's General von Moltke wrote extensively about incorporating the telegraph in operations. He highlighted some of the operational impacts the new technology had on both mission command and the freedom of action by subordinate commanders. From a commander's perspective, General von Moltke understood that the telegraph afforded a rapid means by which commands could quickly send reports throughout the battlefield and synchronize efforts to achieve "a common goal."[4]

The importance of the telegraph in providing a capable means of transmitting information and providing a method by which commands coordinated efforts required those same commands to ensure that telegraph lines were established to allow for the flow of information. At the end of the Prussian campaigns of 1866 and 1870-71, the Prussian field and state telegraph services had over 24,000 kilometers of telegraph lines consisting of 1,780 field lines and 526 telegraph stations.[5] Additionally, safeguards, such

[4] Hughes, ed. *Moltke on the Art of War; Selected Writings,* 113.
[5] Ibid., 121.

as codes and control measures, were required to prevent interception or interference of critical transmissions by the enemy.[6]

General von Moltke, however, also noted the potentially detrimental effects of this new means of communication. If a commander was now connected, there was a possibility that centrally controlling decision-making, and the potential of receiving "orders from a distance"[7] would impinge on the freedom of action of a subordinate commander, essentially leashing him. Therefore, it was an imperative to allow commanders in the field freedom of action without undue command influence adversely affecting the "independence, rapid decision, and audacious risk"[8] required for successfully prosecuting war. Von Moltke identified the fact that too much communication might negate initiative by a commander if higher commands were to second-guess decisions or constantly try to drive operations from afar.

The Radio

Invented by Guglielmo Marconi at the end of the 19th century, the radio was equally revolutionary in terms of communication and heralded a new epoch in terms of command and control from afar.[9] Unlike the telegraph, which required wires and significant training to operate, the radio over time freed the user from being tied down to a static location.[10] The span of control, enabled by advances in radio technologies, eventually expanded to the point where a soldier on the ground could communicate directly to a pilot in the air or a ship on the ocean with relative ease.

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[6] Ibid., 113-114.
[7] Ibid., 77.
[8] Ibid.
[9] Unknown, "Who Invented Radio," Washington State University, http://public.wsu.edu/~bryan.mclaughlin/Radio/Who_Invented_Radio.html (accessed October 31, 2017).
[10] Brodie, Bernard and Fawn M. Brodie, *From Crossbow to H-Bomb: The Evolution of the Weapons and Tactics of Warfare* (Bloomington and Indianapolis, Indiana: Indiana University Press, 1973), 168.

Use of the radio came to the fore on the battlefield during World War I. While both sides employed this new technology, it was the Germans who tended to use it more effectively. They "believed that it offered a way to transmit commands simultaneously to as many units as had receivers without the bottlenecks and delays caused by telegraph relays or telephone switching stations."[11] While the telegraph enhanced the speed of communication through technology, the radio increased the span of reach across all dimensions of the battlefield: land, air, and sea.

As with the telegraph, the radio also had significant civilian peacetime value, so the advancement of radio systems continued to evolve between both world wars and thereafter. The components became smaller, the technology became more advanced, and the capabilities grew to enable mission command with the means to relay information from the lowest tactical formation to, if need be, the strategic leadership and visa versa.

There were drawbacks such as the ability to intercept transmissions, which required ever-increasing levels of cryptology to safeguard communications. There were also limitations on the ranges. The radios were heavy and cumbersome to carry as well and requiring heavy batteries for power. However, the benefits of having a means to communicate real-time with an element on the ground, the sea, or in the air, far exceeded the shortcomings.

The radio provided the means to communicate wirelessly and facilitated the coordination of an incredible array of resources for the tactical commander. A tactical level commander on the ground and in a firefight could now coordinate for artillery and close air support while providing real time updates to a higher headquarters. Senior

[11] Allan R. Millett and Williamson Murray, eds., *Military Innovation in the Interwar Period* (New York, NY: Cambridge University Press, 2009), 266.

commanders could delegate some of the responsibilities for managing and synchronizing support enablers to lower echelons who could employ them directly.

Digital

The digital evolution in the late 20th century leveraged the convenience of radio while enabling computers to transmit data, which greatly enhanced the flow of information to, from, and throughout the battlefield. The transmission of data was a significant change in the realm of communications because henceforth machines, employed by humans, could communicate remotely and provide the ability for units to convey a host of information passively between systems without impinging freedom of action or inserting the possibility of human error during transmission.

The transmission of digital communications facilitates the employment of systems such as artillery weapons where the transmission of target information is conducted directly from the observer to the firing platform with minimal human interaction. Additionally, commanders now have the ability to observe subordinate unit locations through the transmission of global positioning system (GPS) information by equipment such as the Blue Force Tracking (BFT) system, identifying location as well as the type and disposition of friendly airborne or ground based units.[12] The advent of digital communication changed the flow of information by increasing the amount of data transmitted between units and decentralizing the availability of that information globally while providing the potential to ensure the synchronization of information and guidance.

[12] General Dynamics, "Blue Force Tracking," General Dynamics Mission Systems, https://gdmissionsystems.com/c4isr/blue-force-tracking (accessed 31 October, 2017).

The 21st Century

The 21st century heralded a new level of technology accessible to the military as well as the public in general. Cellphones, smartphones, computers, and the internet made global communication instantaneous. Access to communications technology is not reliant solely on military means, but now commercial communications are employable by everyone, and the technology appears readily on today's battlefields.

Al Qaeda in Iraq (AQI) was able to employ the internet and cellphones in order to conduct operations through simple networking. The access to readily available means of communications allowed a nascent insurgency to create a formidable networked entity that used off-the-shelf technology to "communicate real-time all the time."[13] AQI, as an organization, was able to create a communications environment that was both highly efficient and effective, unencumbered by more technologically advanced, secured, but stovepiped systems employed by the Coalition forces operating in Iraq.

Commanders face a paradox. They have the ability to be super-informed and connected and there is a real temptation to want more and understand any problem to a granular degree but doing so inserts the potential of micromanagement. Certainly building commands with efficiency in mind is good and JC4I facilitates this, but where JC4I has the potential to excel is in expanding the effectiveness of joint commands.

However, the joint force faces a significant problem. Until now, the concept of having a truly integrated JC4I architecture to support C2 and operations has been an unrealized goal. The reality is each Service purchases what it deems appropriate for its

[13] Anonymous *Meet the Author - General Stanley McChrystal, USA (Ret.) - "Team Of Teams" - Full Version,* Video, directed by MarinesMemorialClub (Marines Memorial Club, July 17 2015), https://www.youtube.com/watch?v=sKMm4DwzXx0.

own specific operational requirements first, with the idea of joint requirements as a secondary consideration afterthought. This method of purchasing is contrary to guidance provided by Chairman of the Joint Chiefs of Staff, General Dempsey, and counter to attempts by the joint staff to integrate capabilities in order to achieve a high level of interoperability.

Chapter 4: Joint Command, Control, Communications, Computers, and Intelligence

The advent of technology has had a significant impact on mission command, especially for providing the means to enable command and control and guide the transfer of information. In an ideal joint realm, a comprehensive JC4I architecture facilitates the efficiencies and effectiveness of mission command to gain operational and strategic advantage. Enabled by streamlined networked systems and platforms integrated within comprehensive communications architectures, JC4I provides commanders with relevant tools that facilitate timely decision-making across the entire spectrum of operations.[1]

A failure to comprehensively adopt integrated JC4I leads to inefficient systems that diminish the effectiveness of mission command at the joint level.[2] Non-integrated systems mean that communications systems are ad hoc in nature and the ability to integrate, ensuring that systems interact seamlessly, relies on luck rather than intent and design. Ad hoc structures lead to increased time and friction when integrating teams into a complicated and dynamic joint environment.

What JC4I provides is simply an ability to communicate and share information that leads to shared understanding. Shared understanding allows the joint commander more effective mission command and is an imperative to integrate operations and direct actions through decentralized execution. McChrystal synthesized this thought by noting successful organizations are those that are able to holistically trust, have common purpose, share organizational consciousness, and empower decentralized execution by

[1] Much of the information germane to JC4I and specifics concerning the applicability to operations and status resides at greater classification levels and can be examined separately. A special thanks to Mr. Tony Oliver, Mr. Arthur "Art" MacDougall, and Dr. Bryon Greenwald for providing guidance pertinent to this research.

[2] Greenwald, "Joint Capability Development", 53.

subordinate commands.[3] In order to do that, organizations must have the means to integrate the way they communicate, make decisions, and transmit that information.

Adopting new practices also requires a change in thinking to allow such interoperability to work. The lack of a unified JC4I architecture hampers the process of decision-making and managing operations. In a world where events occur quickly and the decision-making cycle is considerably compressed, the time available to make decisions is invaluable, and the lines of communication and control supporting commanders need to be streamlined and made interoperable in order to conduct successful operations. The necessity for efficient communications is especially true in data intense and time constrained environments where decisions have to keep pace with real-world events in order to precede decision-making cycles.

General McChrystal noted that Al Qaeda in Iraq (AQI) successfully leveraged off-the-shelf 21st century technology to command, control, and inform in a way that allowed the organization to work real-time and operate effectively against U.S. and Coalition forces. The employment of commercially available cell phones and the internet was significant in terms of being not only efficient in their employment of available resources, but also in terms of enhancing their organizational effectiveness. The broad availability and access of communications technology allowed AQI to operate in a distributed way against a numerically superior and better-armed adversary.[4] It was not until JSOC restructured as an organization and incorporated existing JC4I systems that it effectively countered AQI.[5] JSOC successfully implemented mission command practices

[3] McChrystal et al., *Team of Teams: New Rules of Engagement for a Complex World*, 20.
[4] Ibid, 59.
[5] Ibid, 20.

to ensure unity of effort through shared understanding as a requisite to defeating a distributed adversary.[6]

What JC4I Provides

Imagine if iPhone users could only talk or text with other iPhone users and Android phone users could only talk and text with other Android users. Would that system divide be useful to smartphone owners in general? More to the point, how can someone send lifesaving information as an Adobe document if the recipient does not have a compatible means to read the information? Imagine the added complexity and friction introduced in combat where elapsed time and information are critical.

In essence, JC4I delineates how joint force structures comprised of disparate elements synchronize the conduct of command and control operations and manage communications, computers, and intelligence systems within a joint headquarters. Command and control is defined as the "exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission."[7] Critical to maintaining the ability to command and control is the ability to make informed and timely decisions using up-to-date information supported by a communications system.[8]

While a Service's C4I system is relatively stable and integrated, especially at the tactical level, C4I in the joint realm is more complicated since there are varieties of different systems (Apple and Android operating systems) inhibiting seamless integration

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[6] Anonymous *Meet the Author - General Stanley McChrystal, USA (Ret.) - "Team of Teams" - Full Version,* Video, directed by MarinesMemorialClub (MarinesMemorialClub, July 17 2015), https://www.youtube.com/watch?v=sKMm4DwzXx0.
[7] U.S. Department of Defense, *DOD Dictionary of Military and Associated Terms,* 41.
[8] Sean Monteiro, *Joint Doctrine Joint Communications System: Lesson 100-2; JS J6 JC4I Cyber*, (2017) 20. Power Point Slides for the Jc4I Cyber course at the Joint Forces Staff College; Lt Col Sean Monteiro is an instructor.

between Services in a joint environment. Often the communications between different weapons platforms and Services are ad hoc, informal, and operators choose voice instead of digital communications due to personal familiarity and lack of compatibility between systems. Seamless integration occurs when the digital interfaces supporting each system connect easily and transmit data that is readable by both systems without error or corruption of the data.

Current integration efforts are akin to trying to match Lego and Mega Bloks where pieces may seem to work together, but in fact result in a hodgepodge of systems that only function on the periphery in limited ways. This is the case with the Army's Advanced Field Artillery Tactical Data System and an Air Force airborne sensor where human input is needed to ensure that the data is translated and requires employing a secondary common communications platform such as mIRC,[9] an Internet Relay Chat. The speed and accuracy of this interface because of the manual translation and transference between systems involves additional time to process and transmit information that can adversely affect efficiency and effectiveness.

Concepts for Evaluating the Role of the Joint Communications System

JC4I is comprised of command and control systems through computers and cyberspace that provide information throughout the environment. "A joint communications system is comprised of the networks and services that enable joint and multinational capabilities. The object of the joint communications system is to assist the joint force commander (JFC) in command and control (C2) of military operations."[10] It

[9] "mIRC," mIRC.com, https://www.mirc.com/index.html (accessed February 20, 2018).
[10] U.S. Joint Chiefs of Staff, *JP 6-0: Joint Communications Systems*, Joint Publications 6-0 (Washington D.C.:Joint Chiefs of Staff, June 10 2015), vii.

provides the backbone that enables the transfer and dissemination of information. The more integrated the systems, the easier it is to communicate between platforms. Achieving this facilitates mission command for the joint force.

Achieving that seamless integration of C4I requires a methodical and integrated acquisition and implementation process instead of the piecemeal approach taken by the Services. Commanders leverage communications to make informed decisions and provide a means by which to disseminate and issue guidance to subordinate units and coordinate with peers and superior commands. In essence, "Effective C2, through the exchange of information, integrates joint force components and allows them to function effectively across vast distances, in austere or complex environments, and in all weather conditions."[11] JC4I provides the concepts necessary to evaluate whether integration is seamless or gap laden.

Joint Publication 6-0: Joint Communications System defines the specific role of the joint communications system as, "the JFC's principal tool to collect, monitor, transport, process, protect, and disseminate information. Given the criticality of information, the security of the communications system is paramount to ensuring the JFC can trust the information it provides."[12] The JFC is the hub of information processing and should do so holistically. The JFC must provide the correct information to the requisite recipient at the time that is appropriate in order to enable the subordinate.[13]

[11] U.S. Joint Chiefs of Staff, *JP 6-0 Joint Communications Systems,* viii.
[12] Ibid.
[13] Monteiro, *Joint Doctrine Joint Communications System: Lesson 100-2;* JS J6 JC4I Cyber, 24.

There are eight functions that a communications system should provide in order to be considered effective: acquire, process, store, transport, control, protect, dissemination, and present.

Table I: 8 Communications Functions

Acquire	The acquisition of information into the communications system that is required for decision-making and situational awareness
Process	The specified sequence of operations performed on well-defined inputs to produce a specified output facilitating both shared knowledge and relevant information for commanders
Store	Retaining, organizing, and disposing of data, information, or knowledge to facilitate sharing and retrieval leading to unity of effort
Transport	Transporting is the end-to-end information exchange and dissemination in a global environment across joint force command and control systems; providing the right information to the right person at the right time for action
Control	Control is the function of directing, monitoring, and regulating communications system functions to fulfill operational requirements within specified performance parameters across all systems; aid in the uninterrupted and uncorrupted flow of information
Protect	Protection of the integrity of information, secure processing, and transmission with access only by authorized personnel across appropriately classified systems
Dissemination	Distributing processed information to the appropriate users and ensure shared understanding
Present	Information provided to the user in the method that best facilitates understanding, use, and decision making to facilitate mission command

Source: Joint Publications 6-0; Joint Communications Systems, p. I-7

On the surface, these eight functions of communications appear to be straightforward, and they are, theoretically; however, in practice within a joint environment, these functions can become extremely complex because persuading the Services to embrace joint considerations occurs when it is convenient and not because it is mandated.[14] Within a Service, communication systems are relatively integrated. However, systems are not always compatible when operating across Services since they traditionally have not been designed specifically for use in the joint environment.

[14] Greenwald, "Joint Capability Development," 51.

As a result, the transfer, or transportation, of data is not always seamless and sometimes requires additional steps to transmit between communications platforms. The inability to transfer may adversely affect positive control of information, undermine the protection of classification caveats, and impede effective dissemination to interested parties who have a need to know, but may not have the appropriate systems available to either transmit or receive data. The successful transfer of information is a challenge for joint operations and impedes efficient and effective mission command.

The seams and gaps within a joint community, due to non-integrated JC4I systems, create friction that impedes unity of action, unity of effort, as well as shared understanding. Integrating a JC4I architecture is an imperative within a dynamic environment since it affects an organization's ability to operate effectively. The less integrated the systems are the less agile organizations become, and the less agile an organization is the further inhibited the execution of mission command, through either flawed JC4I architecture or implementation.

Congress, through the 2017 National Defense Authorization Act (NDAA), and the Chairman of the Joint Chiefs of Staff, through the Joint Requirements Oversight Council (JROC) and Joint Capabilities Integration and Development System (JCIDS), directed the interoperability of the joint communications systems within the last three years.[15] The top down direction provides the impetus for creating an integrated communications environment that is beneficial to the joint force. In order to generate a utopian version of

[15] U.S. House of Representatives. Conference Report, "National Defense Authorization Act for Fiscal Year 2017," 114th Congress 2nd Session, Report 114-840 (November 30, 2016); U.S. Joint Chiefs of Staff. *Charter of the Joint Requirements Oversight Council (JROC)*, Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 5123.01G (February 12, 2015); U.S. Joint Chiefs of Staff. *Joint Capabilities Integration and Development System (JCIDS),* Chairman of the Joint Chiefs of Staff Instructions (CJCSI) 3170.01I (January 23, 2015).

JC4I it would necessitate throwing out current systems and starting fresh. This is not practical nor feasible given the current level of operational tempo sustained by the DoD. The directives from Congress and the joint community, however, provide guidance to ensure future systems meet the requirement to become joint and move away from Service-centric. As legacy systems and programs become obsolete and are discarded, newer and integrated JC4I systems can be acquired and employed at all operational levels.

Critical JC4I Principles and Why JC4I is Important

JC4I structures have four key principles applicable to what should be instrumental for any structure to meet the needs of a joint force commander and enhance the effectiveness of mission command and the theme of a unified command. These are: interoperability, agility, trusted systems, and shared systems.[16]

Interoperability exists when information is exchanged seamlessly between communications systems throughout a command. Interoperability achieves the desired functions of processing, transporting, and disseminating information.[17] Information must be processed and transported between commands by way of communications platforms. The dissemination of information ensures that the appropriate decision makers receive the relevant information and gain common situational awareness and shared understanding. Disseminated information ensures "the ability to operate in synergy [with] the execution of assigned tasks."[18] Common equipment, compatibility of equipment, standardization, and liaisons facilitate synergy.[19]

[16] U.S. Joint Chiefs of Staff, *JP 6-0 Joint Communications Systems,* I-8.
[17] Ibid.
[18] Ibid, GL-5.
[19] Ibid, I-9.

System agility attributes rely on responsiveness, flexibility, innovation, adaptation.[20] To be useful, JC4I structures need to be adaptive and flexible to a continuously changing environment. If an architecture does not adapt or flex, then a sluggish structure constrains the freedom of decision-making and action for any commander, making the joint force vulnerable. JC4I systems need to incorporate the latest innovations to provide both a tactical and technological edge within the operating environment.[21] System agility achieves the functions of transporting, disseminating, and presenting information for the commander.

Trusted communications must achieve survivability, security, and sustainability to enable a robust means for communications for the joint force. Survivability meets the principal communications function of protection. Security enables the functions of processing, storage, transport, control, protection, and dissemination of information. Sustainability ensures that all communications functions remain relevant and adequate.

The principle of sharing ensures that there is a mutual use of information, services, and/or capabilities.[22] Sharing covers all aspects of communications system functions and is paramount for a joint command and its ability to conduct mission command. The whole premise for a joint warfighter is to be able to share information, and it requires a capable JC4I architecture by which to accomplish it. As McChrystal demonstrated with TF 714, shared information leads to shared consciousness and situational awareness and directly facilitates unity of effort and simplifies unity of command.[23]

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[20] Ibid.
[21] Monteiro, *Joint Doctrine Joint Communications System: Lesson 100-2;* JS J6 JC4I Cyber, 29.
[22] U.S. Joint Chiefs of Staff, *JP 6-0 Joint Communications Systems,* I-9.
[23] McChrystal et al, *Team of Teams: New Rules of Engagement for a Complex World*, 153.

It is critical that systems, both hardware and software, purchased by the Services actually enable mission command in order to minimize the time and effort it takes to integrate within joint structures. Policy should dictate that this be the norm rather than the exception. Doctrine provides the guidance by which joint communications are employed with the commanders having the ability to adapt the systems as they see fit to meet the needs of the operating environment.

Examples of Principle and Functional Failures

Two examples illustrate the importance of an integrated JC4I program.[24] The first, involving two U. S. Army units, is of an artillery battery attached to a maneuver brigade for a U.S. Army National Training Center (NTC) rotation. Both units had comparable battle tracking hardware known as Blue Force Tracker (BFT), but had different versions of the software. Because of this, neither could effectively leverage the full capabilities of the BFT and the lack of compatibility hampered the ability to effectively battle track and communicate digitally.

While this was during a training evolution, the ramifications of suffering version control issues in a high intensity conflict could be catastrophic. Both units were part of the same division, but were undergoing software updates during different fielding times. The lack of compatible versions violates the concept of trusted communications, which jeopardizes lives. To be specific, the incompatibility between the versions of the BFT violated all four principles of joint communications: interoperability, agility, trusted systems, and shared systems. Additionally, the acquisition, transport, control,

[24] The first two examples are based on personal experiences and observations while serving either as a battalion commander or as an observer for an exercise.

dissemination, and timely usefulness of the functions of joint communications functions were adversely affected.

The integration of different Services employing different digital communications platforms can be problematic when those systems do not communicate clearly, which was demonstrated when an Army artillery unit employing an Advanced Field Artillery Tactical Data System (AFATDS) supported an Air Force exercise with the aircraft communicating with Link 16 as a communications protocol. When employing aircraft as observers for joint fires, the lack of interoperability between the digital platforms necessitated the employment of mIRC and a human intermediary to transpose the requests for fires into firing orders through the AFATDS. The workaround in communications linking non-communicating assets in a joint environment unnecessarily complicated the principles and functions of processing, dissemination of information, and required additional measures to achieve mission success. The translation process involved the introduction of additional steps and thus more room for error into an artillery mission.

An example of real-world communications frustrations is illustrated by communications issues experienced during the first year of Operation Iraqi Freedom. USMC and US Army ground units, and coalition forces, comprised mainly of British troops, had problems with tactical communications. The Marines employed the Mounted Digital Automated Communications Terminal (MDACT) while the Army relied on the nascent BFT. "Marine commanders often had to monitor both systems to keep track of their own forces as well as neighboring Army and UK troops. Marine units issued one of the systems [MDACT] and needing to communicate with a unit using the

other type [BFT] would have to resort either to a third party or use a courier to deliver a message."[25]

While the first two instances occurred during training events, the third example illustrates the complications arising from employing two different pieces of communications gear in combat, and demonstrated the fallibility of the joint force reliance on Service procured systems. Success in warfare requires joint synergy and will require the Defense Department to understand and parlay the positive aspects of Service-centric programs while developing joint interoperability and interdependence.[26]

The DoD clearly recognizes the need to ensure a joint focus on procurement, testing, and fielding. However, the Department has not enforced the requirement. The employment of Service specific C4I systems will continue with the hope, but not the guarantee, that the Service-centric systems will work together. If the DoD does not enforce the requirements to integrate, then the joint force will be required to incorporate ad hoc solutions to fix the lack of interoperability. It would be better, however, to first identify a need and requirement across the joint force, and then build JC4I systems to fulfill them with a focus on ensuring joint compliance and employment before incorporating new technologies into the battlefield.

[25] Doug Mohney, "Radio Woes Plague Marines in Iraq," IWCE's Urgent Communications, http://urgentcomm.com/mag/radio-woes-plague-marines-iraq (February 20, 2018).
[26] Greenwald, "Joint Capability Development," 51.

Chapter 5: Conclusion

Mission command, coupled with JC4I technology and methodology, facilitates the art of command and the science of control. To be more effective at executing tasks and efficient at employing finite resources in an ever-increasing joint command structure, commanders must leverage the appropriate capabilities to achieve the necessary effects through land, air, sea, space, and cyber domains in order to facilitate mission accomplishment. Joint commanders should apply the art of mission command and the joint community must integrate JC4I in order to simplify command architecture, build C2 interoperability, and create a comprehensive joint understanding and employment of mission command.

Joint Publication 1, Doctrine for the Armed Forces of the United States, helps to frame why mission command is important because it ensures interoperability, provides a distinct capability for the force, and maximizes the effectiveness of a joint force.[1] The basic premise for a joint force, in addition to interoperability among the components, is the ability to synchronize holistically instead of piecemeal. The lack of interoperability effectively stymies the joint force in its ability to operate coherently.

Each Service and invested partner provides distinct and unique capabilities to the joint commander, and leveraging those capabilities effectively provides the joint commander a vast array of options to employ against an adversary. However, those capabilities must be leveraged synergistically and operations must be synchronized to achieve a desired end state. Synergy and synchronicity are facilitated through the employment of mission command and a comprehensive JC4I architecture.

[1] JP 1, I-2.

Mission command is the philosophy of "the conduct of military operations through decentralized execution based upon mission-type orders. It empowers individuals to exercise judgement in how they carry out their assigned tasks and it exploits the human element in joint operations, emphasizing trust, force of will, initiative, judgement, and creativity."[2] JC4I provides the coordination mechanism to "facilitate integration, synchronization, and synergistic interaction among joint force components."[3] JC4I also provides the means, through technology, by which the sharing of information is possible and the means to promote cooperation and compliance.[4]

To facilitate the implementation of mission command, joint doctrine must provide a more holistic guide recognizing how to implement mission command for the joint commander since each Service provides its own respective understanding of mission command. The Army provides the most comprehensive definition of mission command through the *ADRP 6-0*. While joint doctrine currently does provide a superficial definition of the concept of mission command, it should go a step further and adopt a common reference point for all Services to understand both the philosophy and functions of the concept.

The historical trends of integrating technology demonstrate that Services and components focus on what is good enough for each of them, and not what is necessary for the joint force. Such a limited focus has led to piecemeal solutions, even within the same organization, thereby stymieing the seamless integration of C4I systems and leading to diminished effectiveness of the collective organization. Additionally, the lack of a

[2] JP 1, V-15.
[3] JP 1, V-16.
[4] JP1, V-15.

coherent inter-service C4I system reduces the ability to integrate effectively within a joint environment where disparate units are employed to provide tactical solutions to strategic and operational level problems.

The philosophy of mission command is probably the easiest to fix, as each Service has an idea as to what mission command is, but a common reference point would clarify both what mission command means for the joint commander and why it is important to understand and adopt. Finding a solution towards a comprehensive JC4I architecture, on the other hand, has proven to be more challenging because the Services are currently free to pursue systems that suit their purposes first, with the idea of interoperability as a secondary goal. TF 714 demonstrated the benefits of achieving mission command aided by integrated JC4I. Those lessons learned should be brought forward to the joint force community as a whole in order to enhance organizational effectiveness and efficiencies.

For the joint commander, both mission command and JC4I are inexorably linked. Non-integrated and Service specific C4I architecture limit current concepts of mission command, which is problematic because it creates the stovepiping of units instead of a system allowing for a greater capacity to integrate different capabilities. The failure to empower the joint force commander with a truly joint capable force limits organizational success. Ensuring integrated communications is the only way to provide distinct organizations the ability to plug-in, play, and support the joint commander, while setting aside Service specific cultures that preclude seamless integration. This only becomes harder when working with allies and partners who do not have the same communications capacity or understanding of mission command.

While the start of the 21st century has proven to host an amorphous operating environment, there is no indication that the rest of the 21st century will become any less challenging. As a result, there will be a reliance on adaptive and effective joint organizations to address the challenges of operations within such an environment. Integration of components continues to require rapid incorporation to achieve a level of efficiency and effectiveness in order to provide the joint command unity of effort, decentralized operations, unity of command, and agility within the dynamic environment.

The joint community, possibly through emphasizing the Joint Requirements Oversight Council and by implementing the Joint Capabilities Integration and Development System with the emphasis provided by Congress's 2017 NDAA, must have the capacity to compel integration instead of relying on the Services to figure it out on their own. If anything, they have individually demonstrated a reluctance to do so. The most concerning problem, however, is that the 2018 version of the NDAA does not have the same sound emphasis on promoting "jointness".[5] It is to the collective benefit of the future JC4I architecture to achieve integration and support mission command for the joint warfighter.

[5] U.S. House of Representatives. Conference Report, "National Defense Authorization Act for Fiscal Year 2018," 115th Congress 1st Session, Report 115-404 (November 11, 2017).

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Vita

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